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## Users of the ARPA Network

### INTRODUCTION

This document attempts to define who are the users of the Arpanet, what kind of usage they make of the network, and what are some of their interests and objectives. It is submitted to the Users Interest Working Group (USING) by the User Definition Subcommittee for the purpose of helping USING identify specific user problems and make recommendations accordingly.

### WHO ARE CURRENT USERS OF THE ARPANET

At present there are no statistics that adequately describe how many users there are on the ARPANET, and there is no network-wide user analysis system in operation to help us discover what functions available on the net are most used and for what purposes. We can only make suppositions at this point.

The one set of figures we have is taken from the ARPANET Directory; unfortunately, they refer mostly to host computers, except for the figures on individuals, which include only those who communicate with the Network Information Center (and we are not sure what percentage of the total network user population they represent.) We do not now know how many people use each of these computers, nor how the service categories correspond to the distribution of the user population.

In a similar manner, we know that the computing centers are geographically concentrated in four areas in Boston, California and Washington, D.C., but we again do not know the number of users associated with them, or even if the users are geographically adjacent to the centers they use.

We offer the figures here for an indication of the affiliations of the network community.

	Gov't*	University	Commercial**	Foreign
SERVER HOSTS	3	19	10	1
USER HOSTS	10	14	8	1
TIPS	12	5	8	2
INDIVIDUALS	248	379	328	83
ORGANIZATIONS	33	43	37	14

\*Includes military and non-military (such as NASA, NBS, etc.)

\*\*Includes non-profit research organizations.

Presumably there exist some host-initiated efforts at statistics-gathering; it would be useful to examine these for relevant data or for suggestions of better methods. We would like to have a uniform user analysis system available at all (or many) sites, (the uniformity being essential for correct analysis), in order to understand the current resource utilization and to better plan for the future needs of network users. Developing a system of this sort will, however, be costly to implement, may cause inefficient system overhead, and runs the risk of invasion of user privacy. A careful plan must be worked out, hopefully in coordination with the Performance Measurement Lab which will be gathering similar statistics.

A precaution, however, is necessary: the nature of the ARPANET is changing (e.g. the types of resources available, the focus of the services offered) and as a result the composition of the user population will also change. With the heavy emphasis in the past on network development, most of the work being done by network users contributed directly to this goal. Programmers are probably the heaviest users at present, and many of the existing resources are biased toward their usage. It appears, however, that future development will correct this bias.

Some subgroups that are already forming within the network community are the ARPA-funded R & D groups, the Air Force Systems Command, the Army Materiel Command, the weather community and the seismic community. Contact should be made with these groups to discover what their particular needs, goals and plans are for ARPANET use.

## USER PROFILE BASED ON ACCESS

There are several angles from which one might analyze the user community: according to their end goal (their purpose in using any computing facility, and particularly the network), the resources they use and the functions performed on the net, and their method of interfacing with the net. The latter categorization will be useful in diagnosing problems along the path between the user and his resource. This ranges from site-specific problems for the local user with no network association to complicated inter-host and subnetwork problems for the distributed-resource user who sees the entire network as a single machine available from his terminal.

## 1. Single Host Users

- a. Local User (A user with a direct line into the one computer he uses - usually the home facility or 'company' computer).

This user deals directly with site personnel for any problems.

- b. Remote-Local Single-Host Interactive User (A user accessing a single host through a TIP or ANTS with no computing facilities on his end of the connection).

This user relies on the service host and a given network group (TIP, ANTS, MCC, or other) to solve his user problems and issues. He is network dependent, but single host oriented, and is largely oblivious of network hosts other than the one he is using.

- c. Remote Single-Host Batch User (Currently a user using an RJE device dialed directly into a single distant computer host.)

This user's problems are similar to the remote single-host interactive user, except that his turnaround time is longer. In the future when RJE devices are attached to both the ANTS and TIP, responsibility for user issues will shift to those support groups and away from the service host.

## 2. Multi-Host Users

- a. TELNET user (A user using his primary host's user-TELNET program to occasionally access other network computers.)

His motivation generally is to use a resource that is not available on his home host. Responsibility for service lies between the two host computers and the overseeing network group.

b. Function-Oriented Protocol User (A user needing the use of other protocols such as FTP or RJE to accomplish work on other computers)

The user will most often deal with the site providing the user-process front-end for the protocol, unless he accesses the server directly.

c. Multi-Server User (A user accessing many hosts through a TIP or ANTS because he has no computing facilities of his own).

This user spreads his work over many hosts and may not have a home host. This group has the most direct network interaction.

### 3. Distributed Resource Users

This user accesses resources from other network computers through a front-end on his primary computer; all "foreign" computers and inter-host communication are invisible to him. The front-end site maintains responsibility to the user for all problems with the system.

## USER PROFILE BASED ON FUNCTION

Once we have catalogued "how" users access the net, we need to pinpoint "what" it is they are doing--i.e. the types of computing function they utilize and the type of job they are trying to accomplish. This will make it easier to evaluate available and projected resources to best suit the needs of the user.

We present here a table of typical computer applications followed by a listing of computer use functions (numbered for convenience). The table indicates which of the use functions would be invoked by a novice, average, or expert user to carry out the particular application.

## A. Program preparation (interactive).

novice: 1,2,3,4,5,6,7,13,14  
 average: 1,2,3,4,5,6,7,8,13,14,15,17  
 expert: 1,2,3,4,5,6,7,8,11,13,14,15,17,20,21,22

## B. Program preparation (batch).

novice: 1,2,3,4,5,6,7,13  
 average: 1,2,3,4,5,6,7,8,13,14,15  
 expert: 1,2,3,4,5,6,7,8,11,13,14,15,22

## C. Execution of locally developed programs (programs written by or for the local user for which expertise exists locally).

novice: 2,4,6,7,15  
 average: 2,3,4,6,7,9,10,14,15,17,18  
 expert: 2,3,4,6,7,9,10,14,15,17,18,19,20,21

## D. Execution of remotely developed programs (application packages).

novice: 2,4,7,15,22  
 average: 2,4,7,9,10,14,15,17,18,22  
 expert: 2,4,7,9,10,14,15,17,18,19,20,21,22

## E. Data base creation and management

novice: 2,3,4  
 average: 2,3,4,10,18  
 expert: 2,3,4,10,18

## F. Documentation preparation

novice: 2,4  
average: 2,4,17  
expert: 2,4,17,20

#### G. Teleconferencing.

novice: 12  
average: 12,17  
expert: 12,17,21

#### H. Use of "mail" services

novice: 16  
average: 2,16,17  
expert: 2,16,17,21

Following are some typical computer functions executed by users. Note that they are biased toward the programmer rather than the end user.

1. Source program file creation, modification, deletion. Either interactively (editor) or batch (deck submission).
2. Data file creation, modification, deletion. User-created (character), program created (binary).
3. Object program library creation and maintenance. Compiling into specified library, use of generations of program changes, object module patching.
4. Specification of files for program I/O. Allocation of space, communication with various languages.
5. Program compilation. Optimization options, listing control, subroutines.
6. Program loading (linkage editing). Control of library search, specification of physical arrangement of modules, handling of "common".
7. Program execution. Calling main program, parameter passing.
8. Program debugging. Display of variables and registers, dumps, setting of variables and registers, stopping and restarting, break~ points.
9. Control of devices. Tapes, disks, printers, readers, volume mounting.

10. Sharing of files. Access control, sharing by list, naming conventions.
11. Program-program interprocess communication. Naming conventions, command communications, data communications, control of receipt of messages.
12. User-user interprocess communication. Naming conventions, "linking" versus "sending a single message".
13. Message delivery. Submission, notification, delivery (on-line, off-line).
14. Obtaining system status information. Performance, other users, configuration.
15. Obtaining usage status information. Memory allocated, cpu time, charges, file storage used.
16. Access to "help" facilities. On-line, off-line, consultant, scenarios.
17. Controlling system operating modes. Keyboard mode, translations, message suppression, control of prompting.
18. File archiving. Automatic and/or user-controlled, restoring files.
19. Initiation and control of nonconversational jobs. Creating a job from a terminal session, "detaching" a terminal from a task, monitoring and controlling such a task.
20. Definition of user-written commands. Naming, parameter passing, sharing such commands, use of libraries.
21. System tailoring. Synonyms for commands, defaults for parameters, use of user-supplied messages.
22. Reporting of problems. On-line versus off-line, system problems, application program problems.

## USER PROFILE BASED ON PROFESSIONAL INTEREST

This profile presents a list of kinds of users based on their professional interests. It should be emphasized that this list is representative rather than exhaustive, and although all of these types of users have been known to use the network, there is no reliable analysis of the type or volume of use by any given kind of user. Professional groups with similar uses of the network are listed together, and suggestions of some functions they might utilize are given.

1. Systems work - Program and data preparation; program distribution

Systems programmers and analysts

Network Analysts

Operators

Computer Hardware Experts

EDP Personnel

Computer Security Experts

Graphics Experts

2. Information retrieval and Data management - Data preparation and distribution; program preparation

Data Base Managers

Information Retrieval Experts

Management Information Specialists

3. Office and Managerial Work - Message sending; documentation preparation and distribution; scheduling; filing and library work; accounting

Management Personnel

Technical Writers

Librarians

Clericals



Editors

Accounting and Billing

Project and Program Managers

Military Planners

Telecommunications Policy Makers

Science Policy Planners

4. Committee work - Documentation preparation; message sending; on-line (forum) discussion

Special Interest Groups

Standards, Protocol Committees

5. Applications - All of the above-mentioned functions

Mathematicians

Engineers

Behavioral Scientists

Economists

Political Scientists

Communications Engineers

Physicists

Doctors, Medical Researchers

Artificial Intelligence Experts

Space Scientists

Equipment Designers

Speech Understanding Experts

## RECOMMENDATIONS

Some preliminary statistics should be obtained to determine if a full-blown usage analysis system is necessary, and if so, what its objectives should be. We suggest querying sites with nodes on the network, as well as analyzing the information already available at the NIC.

Server sites should be queried about the number of users on their machines as well as the resources most frequently accessed (if that information is obtainable.) Any distinction between net and local users would be helpful.

The relative usage of batch and interactive modes should be explored.

User sites should similarly be queried about the number of users, and the relative amount of network access among their users. Figures on which network sites were accessed most often, least often, etc. would be useful, if those statistics are gathered on-line.

TIP sites could provide information on how many ports are available, both direct and dial-in, and what percentage of time these are being used.

In the future, a larger scale analysis system could be established to find out who uses what and how often. This should be an automatic mechanism, and developed in coordination with the Performance Measurement Lab, which will be supervising other statistics gathering. Some considerations to its design and implementation are:

- classifying the types of data to be collected and the use to which they will be put,

- estimating what operational overheads might be involved,

- understanding how the user would be involved for differing levels of data collection (i.e. how much knowledge and control would the user have over the data collected about himself),

- and clarifying the main objectives of the analysis and its effects for the user.